

# Failure of Mesenteric Defect Closure After Roux-en-Y Gastric Bypass

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## ABSTRACT

**Background and Objectives:** Bowel obstructions following Roux-en-Y gastric bypass (RYGB) are a significant issue often caused by internal herniation. Controversy continues as to whether mesenteric defect closure is necessary to decrease the incidence of internal hernias after RYGB. Our purpose was to evaluate the effectiveness of closing the mesenteric defect at the jejunojejunostomy in patients who underwent RYGB by examining this potential space at reoperation for any reason.

**Methods:** We retrospectively reviewed medical records of patients undergoing surgery after RYGB from August 1999 to October 2008 to determine the status of the mesentery at the jejunojejunostomy.

**Results:** Eighteen patients underwent surgery 2 to 19 months after open (n=8) or laparoscopic (n=10) RYGB. All patients had documented suture closure of their jejunojejunostomy at the time of RYGB. Permanent (n=12) or absorbable (n=6) sutures were used for closures. Patients lost 23.6kg to 62.1kg before a reoperation was required for a ventral hernia (n=8), cholecystectomy (n=4), abdominal pain (n=4), or small bowel obstruction (n=2). Fifteen of the 18 patients had open mesenteric defects at the jejunojejunostomy despite previous closure; none were the cause for reoperation.

**Conclusion:** Routine suture closure of mesenteric defects after RYGB may not be an effective permanent closure likely due to the extensive fat loss and weight loss within the mesentery.

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**Key Words:** Mesentery, Closure, Gastric bypass, Morbid obesity.

## INTRODUCTION

Morbid obesity has become an epidemic in the United States. Due to the significant morbidity and reduction in life expectancy associated with severe obesity, the promotion of weight loss has risen to the forefront of medical care. Given that many patients do not lose weight through diet, exercise, or medication, surgery has become the mainstay of therapy, with Roux-en-Y gastric bypass (RYGB) being the most common surgical procedure performed for morbid obesity. While short-term complications from this operation were closely scrutinized for many years, much attention has been recently focused on delayed problems following RYGB.

Bowel obstruction occurs in approximately 3% of patients and has been documented in up to 9% following laparoscopic RYGB.<sup>1-5</sup> One cause of this problem is internal herniation. During RYGB, up to 3 mesenteric defects, depending on surgical technique, are formed creating possible spaces for an internal hernia with subsequent development of a bowel obstruction. Various techniques have been described to possibly lower the rates of internal hernias including antecolic position of the gastrojejunostomy and closure of defects with either absorbable or nonabsorbable sutures. Controversy continues as to whether mesenteric defect closure is necessary to decrease the incidence of internal hernias after RYGB. Respected bariatric surgeons argue both sides of this issue, because the literature supports both sides. Even in the group that favors defect closure, debate continues as to whether to use a running or interrupted closure and whether to use an absorbable or nonabsorbable suture.

The purpose of our study was to evaluate the effectiveness of closing the mesenteric defect at the jejunojejunostomy in patients having undergone RYGB by examining this potential space at reoperation for any reason.

## METHODS

Following Institutional Review Board approval, we retrospectively reviewed the medical records of all patients undergoing abdominal surgery after RYGB from August 1999 to October 2008. During this period, it was our practice to routinely examine and record the mesenteric defect closure (or nonclosure) on all redo surgeries, including exploratory laparotomies and diagnostic laparoscopies. As part of the abdominal exploration, the mesenteric closure was examined and closure was documented. The operative notes of the initial RYGB and the subsequent abdominal exploration were reviewed. We included in our analysis patients who had their jejunojejunostomy defect sutured closed during RYGB and the integrity of the closure examined during the subsequent exploration. Comparisons using Fisher's exact test were made between patients who had running versus interrupted closure and those who had permanent versus absorbable sutures.  $P < 0.05$  was considered significant.

## RESULTS

Our study consisted of 18 patients who underwent abdominal surgery between 2 months and 19 months following either open ( $n=8$ ) or laparoscopic ( $n=10$ ) RYGB. All gastrojejunostomies were performed in an antecolic fashion. To close the jejunojejunostomy, running ( $n=8$ ) or interrupted ( $n=10$ ) techniques with permanent ( $n=12$ ) or absorbable ( $n=6$ ) sutures were used. Patients lost between 23.6kg and 62.1kg between operations. Indications for reoperation were ventral hernia repair in 8 patients, cholecystectomy in 4 patients, abdominal pain in 4 patients, and small bowel obstruction in 2 patients. At the time of abdominal surgery, 15 of the 18 patients (83%) had open mesenteric defects at the jejunojejunostomy despite previous closure. No significant difference existed in mesenteric closure based on the type of closure (running or interrupted,  $P=0.7$ ) or the type of suture used (permanent versus absorbable,  $P=0.5$ ). All of the defects were incidentally found and were not the cause of reoperation. The 2 bowel obstructions were related to adhesions.

## DISCUSSION

Our observations demonstrate the failure of mesenteric defect closure after RYGB and explain the occurrence of internal hernias even after defect closure. Small bowel obstruction has been reported to occur in 2.5% to 9.7% of patients after RYGB.<sup>1-3,5-9</sup> The most frequent reasons for the obstructions are adhesive disease or internal hernias.<sup>3,10,11</sup> The manipulation of the small intestine and

the creation of bowel anastomoses predispose patients to form adhesions similar to adhesions that form after other intraabdominal procedures. In addition, the rearranging of the small intestinal anatomy and the creation of abnormal mesenteric defects required during this procedure inherently increase the risk for the development of internal hernias that can cause bowel incarceration and strangulation and even short bowel syndrome.<sup>12</sup> While bowel obstructions after open gastric bypasses have usually been related to adhesions, the introduction of laparoscopic techniques appears to have increased the incidence of obstructions related to internal hernias.<sup>1,13</sup> An inhibitory effect of the CO<sub>2</sub> pneumoperitoneum on adhesion formation may explain this shift in the etiology of bowel obstructions.<sup>14</sup> Recently, Kavic reviewed other potential reasons why laparoscopic surgery may decrease adhesion rates including a decrease in the size of surgical wounds, reduced intraabdominal contact with foreign bodies,<sup>15</sup> maintenance of tissue in a humid environment, less tissue trauma and hemorrhage, pneumoperitoneum to separate tissue surfaces, and the ability to visualize the entire abdominal cavity and evaluate inflammatory changes.<sup>16</sup> In his review, he reported that the majority of studies indicate that laparoscopy may reduce postoperative adhesion formation relative to laparotomy.<sup>16</sup> Nevertheless, the overall incidence of bowel obstructions after laparoscopic RYGB remains low and does not appear to be significantly higher compared with the open procedure; however, this is still debated in the literature.<sup>1,2</sup>

The increased incidence of internal hernias in the laparoscopic RYGB era has sparked controversy in the bariatric literature. A number of questions are still unanswered: Should the mesenteric defects be closed routinely? If so, should all be closed or only the ones most likely to lead to internal hernia formation? What type of suture should be used? Does the technique used influence the occurrence of such hernias?<sup>17,18</sup>

One variable that may affect the rate of internal hernia formation and small bowel obstruction after gastric bypass is the placement of the Roux limb during the construction of the gastrojejunostomy. Antecolic, antegastric placement of the gastrojejunostomy has been postulated to decrease the incidence of internal hernias and small bowel obstructions by eliminating one of the potential mesenteric defects (transverse colon mesenteric defect) compared with a retrocolic Roux position. Indeed a number of studies have documented a decrease in the incidence of internal hernias and small bowel obstructions after antecolic Roux limb placement (0.43% to 3.3%) compared with retrocolic (4.5% to 7%).<sup>3,5,9,19</sup> Some authors have even gone a step

further, suggesting that the position of the jejunojejunostomy during antecolic Roux gastric bypasses may influence the incidence of internal hernias.<sup>20</sup>

Another important variable that may affect the rate of internal hernias after RYGB is closure of the mesenteric defects. The decision to close the mesenteric defects in an interrupted or continuous fashion and the type of suture used has been debated in the literature. Many argue that the closure should be performed using continuous non-absorbable suture<sup>21,22</sup> with some series showing a decrease in internal hernia rates in consecutive patients when closed with permanent suture.<sup>21,23</sup> Other studies, including ours, have found no difference in internal hernia rates between continuous versus interrupted sutures.<sup>19</sup> Intuitively, an obliterated mesenteric defect should prevent the occurrence of internal hernias, and several authors recommend the routine closure of all mesenteric defects, citing a decrease in the rate of internal hernias.<sup>8,9,21</sup> On the other hand, closure of the defects laparoscopically is difficult and adds time to a long procedure on usually sick patients and would ideally be avoided, especially if the gain is little (ie, infrequent occurrence of internal hernias). Furthermore, experience with laparoscopic colorectal surgery where mesenteric closure is not done routinely indicates that it is a safe technique without significant untoward events. Several studies have demonstrated excellent results and a very low incidence of internal hernias without closure of mesenteric defects and have questioned routine closure.<sup>20,24</sup> Furthermore, a recent article has shown that using non-absorbable suture to close the jejunojejunal mesenteric defect, the preferred suture according to most proponents of closure, may in fact increase the incidence of postoperative bowel obstruction.<sup>7,8,21</sup> Another variable that affects the rate of internal hernias is related to surgical technique. Quality of closure and meticulous suturing is paramount to ensure a secure closure without compromise of the blood supply to the intestine.

In our study, we evaluated the integrity of the mesenteric closure long after patients had lost a significant amount of excess body weight following RYGB. We were surprised to find that the majority of patients who were operated on for reasons other than bowel obstruction had reopened their mesenteric closures. Our findings add to the existing debate regarding mesenteric defect closure as they challenge the long-term efficacy of such an approach. If the defects reopen after patients lose a significant amount of weight, as has been postulated due to decreased intraperitoneal fat leading to larger mesenteric defects, the original closure may not protect the patients from the occurrence of an internal hernia. This finding is similar to that of a

recent study by Ahmed and colleagues<sup>19</sup> who reported the majority of internal hernias in their series occurred in patients with a significant reduction in excess body weight (>50%). Furthermore, if the defects remain partially closed, as was the case in some of our patients, they may increase the likelihood of bowel incarceration through the now smaller defects.

Our study is not without limitations. It is a retrospective review of a very small cohort of patients and may not reflect the true incidence of mesenteric closure breakdown. In addition, we cannot determine the timing of the breakdown and the amount of weight loss needed before breakdown occurs. Furthermore, we have little data on bowel obstructions in our overall patient pool and cannot therefore make inferences about the consequence of closure breakdown. Nevertheless, the findings of our study raise a question about the durability of mesenteric defect closure after RYGB. Our report also highlights the importance of long-term patient follow-up and the need for bariatric surgeons to suspect internal hernia in patients who present with hernia symptoms even after prior mesenteric defect closure. Our observational study demonstrates that it is very important for bariatric surgeons to know their results and track their outcomes. This will help identify adverse outcomes that may be related to their surgical technique. In doing so, blind adoption of techniques based on surgical dogma will not occur, and surgeons will have objective evidence to verify good outcomes related to their technique.

## CONCLUSION

Our observational study demonstrates that suture closure of mesenteric defects may not adequately prevent internal herniation following RYGB. Given the ongoing debate about mesenteric defect closure after RYGB, the limitations of the available literature, and the low incidence of internal hernias overall, a prospective, multicenter study may be in order to better answer some of the ongoing questions.

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